Session 797 - Mouse Visual Cortex

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797.24 / Y3 - Neural adaptation and position tolerance increase along a putative ventral visual pathway in rats

November 16, 2016, 1:00 - 5:00 PM

Halls B-H

Presenter at Poster
Wed, Nov. 16, 2016, 4:00 PM - 5:00 PM

Session Type
Poster

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Disclosures

D. Kaliukhovich: None. **H. Op de Beeck:** None.

Abstract

Most neuroscience techniques target rodents as the primary animal model to study neural circuits. By contrast, primates are seemingly exclusively used to study higher-order perception and, in particular, vision. Recent studies demonstrated commonalities between the visual systems of rats and primates. Here we further test these commonalities and, specifically, examine how neural adaptation and position tolerance change along a putative ventral visual pathways in rats (Vermaercke et al., 2014). Based on the literature in primates, an increase for both was expected. To test this, we recorded multi-unit extracellular spiking activity in primary visual cortex (V1) and a downstream area LI of head-restrained Long Evans rats. During recordings for each examined multi-unit site we identified two non-overlapping positions within its receptive field and then probed the activity of that site with 3 different stimuli evoking a strong, an intermediate and little response, respectively. We tested 15 stimulus conditions that were presentations of a single stimulus at either position (N = 6) and presentations of either two identical (N = 3) or two different (N = 6) stimuli in all combinations at the two identified positions. Stimulus conditions were delivered to the animals in sequences (N = 10), with each sequence including all possible pairwise transitions between the tested conditions (N = 226 presentations). Each stimulus condition was presented for 300 ms and separated from each other by a 300 ms long blank inter-stimulus interval. We collected 58 (N = 4 rats) and 52 (N = 3) multi-unit sites in the areas V1 and LI, respectively. We analyzed the data separately for the early (25-175 ms relative to stimulus onset) and late (175-325 ms) phases of the neural response. Neural adaptation was present in each of the 2 areas. We observed no difference in the degree of adaptation across the 15 conditions in either brain area and response phase. Yet, the area LI showed a significantly (p < 0.05) higher degree of adaptation than V1 (67% vs. 33%) for both response phases. The latter held true irrespective of the response strength to the adapter stimulus (p < 0.05). We found significant position tolerance (preservation of stimulus selectivity across the two positions, p < 0.05) only for the early phase of the neural response in the area LI but not for either response phase in V1. Importantly, we failed to reveal position tolerance in V1 despite increasing the sensitivity of our tests. To conclude, our results (***increase in neural adaptation and position tolerance***) parallel those of primates. As thus, this provides further evidence in support of the use of rats as an animal model to study the visual system.